REMARKS

Favorable consideration of this application in its continued examination, based on this amendment and these following remarks, is respectfully requested.

Claims 1 and 3 through 14 remain in this case. Claims 1, 8, and 13 are amended. Claim 2 is canceled.

Claims 1, 2, and 8 were finally rejected under §103 as unpatentable over the Morishige et al. reference[1] in view of the Bednekoff et al. reference[2]. The Examiner asserted that the Morishige et al. reference teaches all of the elements of the claim, except for mixers receiving a first local oscillator signal that has a frequency equal to the center frequency of the transmitter section or a sub-harmonic thereof.[3] However, the Examiner asserts that the Bednekoff et al. reference teaches such a local oscillator signal at such a frequency, and that it would have been obvious to combine these teachings with those of the Morishige et al. reference "to better reduce the interference in the radio".[4] The claims were rejected accordingly.

In response to Applicant's arguments in the amendment of June 22, 2005[5], the Examiner agreed with Applicant that the Bednekoff et al. reference does not teach that the receiving local oscillator (LO) frequency is equal to the center frequency of the transmitter section.[6] However, the Examiner asserted that LO frequency in the Bednekoff et al. reference is inherently a sub-harmonic of that center frequency, on the Examiner's belief that it is inherent, to one skilled in the art, "that the receiving LO frequency in most dual-band radios should be equal to a sub-harmonic of the transmitting center frequency in order to minimize noise."[7] Based on this belief, which is not backed up by any citation to any prior art reference, the Examiner concluded that

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[1] U.S. Patent No. 6,600,911 B1, issued July 29, 2003 to Morishige et al.
[2] U.S. Patent No. 6,603,810 B1, issued August 5, 2003, from an application filed December 30, 1999.
[3] Office Action of September 29, 2005, pages 2 and 3, ¶2.
[4] Office Action, *supra*, pp. 2 and 3, ¶2, *citing* Bednekoff et al., *supra*, column 2, lines 44 through 47; element 365 in Figure 3.
[5] Presumably. The Office Action refers to Applicant's arguments of March 24, 2004, however.
[6] Office Action, *supra*, page 8.

the Bednekoff et al. reference teaches first and second mixers receiving an LO frequency having a frequency equal to a sub-harmonic of a center frequency of the transmitter section. The rejection was maintained.

Claim 1 is amended to clarify its patentability over the prior art, in light of the inherency argument presented by the Examiner. Amended claim 1 now includes the recitation, from claim 2 (now canceled) that the radio is an FDD radio, and clarifies that the transmitter section of that radio transmits in a transmit frequency band having a center frequency. Amended claim 1 now also recites that the receiver section is for receiving a signal in a receive frequency band that is non-overlapping relative to the transmit frequency band, and that the first LO signal has a frequency equal to the center frequency of the transmit frequency band or a sub-harmonic thereof. This transmit frequency band, which has a center frequency upon which the LO signal frequency is based, is therefore clearly not the receive frequency band, in the frequency division duplexing of the claimed radio. The specification clearly supports this amendment to claim 1,[8] and as such, no new matter is presented.

This clarification is intended to clarify that the first LO signal has a frequency that corresponds to the transmit band center frequency in the same FDD radio, and that this LO frequency is different from the center frequency of the signal that is received by the receiver. In other words, the LO signal is therefore not related to the center frequency of the received signal, but is related to the center frequency of an unrelated (to the receive signal) FDD transmit signal from the same radio.

Applicant respectfully submits that amended claim 1 is patentably distinct over the Morishige et al. and Bednekoff et al. references, on the grounds that the combined teachings of these references fail to meet the requirements of claim 1. Specifically, Applicant submits that the Bednekoff et al. reference does not disclose, either expressly or inherently, a first local oscillator signal having a frequency equal to a transmit band center frequency or a sub-harmonic thereof, as asserted by the Examiner.

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[7] *Id.*

[8] Specification of S.N. 09/785,759, page 3, lines 10 through 12; page 4, lines 2 through 4, page 5, lines 1 through 8.

Applicant agrees with the Examiner's admission[9] that the Morishige et al. reference does not disclose mixers in the receiver section of a radio that receive a local oscillator signal at a transmit band center frequency, as required by claim 1. Applicant maintains, however, that the Bednekoff et al. reference does not provide these missing teachings. As previously argued, the local oscillator **365** in the receive path of the Bednekoff et al. reference does not generate a signal that is at the transmit band center frequency or a sub-harmonic thereof. The reference clearly discloses that its local oscillator **365** generates a local oscillator signal (RX LO) that is at a frequency (*e.g.*, 1611 to 1671 MHz) that *differs* from the frequency produced by the transmit local oscillator **375**, which is shown in Figure 3 of the reference as 1930 to 1990 MHz.[10] The center frequency of the transmit local oscillator is thus at about 1960 MHz. The Examiner now agrees that this local oscillator of the Bednekoff et al. reference does not have a frequency equal to the center frequency of the transmitter section. Rather, this local oscillator frequency is instead selected so that the down-conversion of the received signal is effected to a desired intermediate frequency.[11]

In response to the inherency position now taken by the Examiner,[12] Applicant submits that it is not "inherent" to one skilled in the art that a receiver LO frequency is equal to a sub-harmonic of the transmitting center frequency, especially in an FDD radio as now claimed (which Applicant submits is not a "dual-band" radio, as surmised by the Examiner). The entire purpose of frequency division duplexing is that the signals transmitted and received by a single radio are in non-overlapping frequency bands so that the transmitted signal does not (in theory) directly interfere with the received signal. As such, there is no inherent relationship between the transmit band center frequency and the receive frequency in an FDD radio, other than being different from one another as claimed.

And in response to the Examiner's asserted inherency of a "subharmonic" of the transmit frequency, Applicant submits that the common definition of "subharmonic" refers to a wave

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[9] Office Action, *supra*, page 2.
[10] *See also* Bednekoff et al., *supra*, column 6, lines 52 through 57.
[11] Bednekoff et al., *supra*, column 6, lines 17 through 22.
[12] Office Action, *supra*, page 8.

having a frequency that is a fraction of a fundamental frequency. Examples of this common understanding are provided in the U.S. Patents cited on the enclosed PTO/SB/08.[13] These examples refer to "subharmonics" as being one-half the frequency of an RF signal.[14] This is analogous to "harmonics", which as well known in the art, refer to integral multiples of a fundamental ("first harmonic") frequency. In other words, Applicant submits that for a signal's frequency to be a sub-harmonic of another frequency, the signal frequency must have some fractional relationship to the other frequency.

There is no such relationship disclosed by or inherent in the Bednekoff et al. reference between the local oscillator frequency and the transmit band center frequency. As noted above, the Bednekoff et al. reference discloses an example in which the transmit band is 1930 to 1990 MHz,[15] but in which the frequency of its local oscillator **365** is in a range from 1611 to 1671 MHz.[16] There is no simple or meaningful fractional relationship between the local oscillator frequency and the transmit band center frequency of 1960 MHz in this example, nor any other relationship that would cause the skilled reader to conclude that the local oscillator frequency of the Bednekoff et al. reference is in any way a sub-harmonic of the transmit band center frequency. Rather, it is evident from the reference itself that the frequency from local oscillator **365** is selected to provide a desired intermediate frequency of 239 MHz[17]; there is no disclosed relationship between this intermediate frequency and the transmit frequency band of the Bednekoff et al. radio. Applicant therefore submits that the Bednekoff et al. reference fails to expressly disclose or inherently provide a local oscillator frequency, on the receive side of an FDD radio, that is in any way related to a transmit band center frequency, much less be at a subharmonic (fraction) of that transmit band center frequency.

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[13] U.S. Patent No. 6,810,242 B2; U.S. Patent No. 6,370,372 B1; U.S. Patent No. 6,348,830 B1.
[14] '242 patent, *supra*, at column 1, lines 55 and 56, and column 4, lines 22 and 23; '372 Patent, *supra*, Abstract, column 3, lines 62 through 65; '830 Patent, *supra*, column 2, line 66 through column 3, line 4.
[15] Bednekoff et al, *supra*, column 5, lines 62 and 63; column 6, lines 52 through 54.
[16] Bednekoff et al., *supra*, column 6, lines 18 through 22.
[17] Bednekoff et al., *supra*, column 5, lines 52 through 54; column 6, lines 22 through 25.

And Applicant again points out that the location of the Bednekoff et al. reference cited by the Examiner as teaching the local oscillator frequency does not provide these missing teachings. To quote that location of the reference:

> In yet another embodiment of the present invention, a frequency of the single frequency reference signal is equal to a frequency difference between a center frequency of the RF transmitter and a center frequency of the RF receiver.[18]

First, this "single frequency reference signal" is not applied to any mixer in a down conversion portion of a receiver, as required by amended claim 1. This portion of the reference instead refers to a "single frequency reference signal" that is generated by a "test local oscillator" in a "test signal generator", and as such refers to the signal generated by test local oscillator **370** of Figure 3 of the reference.[19] This "single frequency reference signal" therefore does not correspond to the local oscillator signal **365** asserted by the Examiner as teaching the local oscillator signal of claim 1. Secondly, the single frequency of this "single frequency reference signal" is not at the center frequency of a transmitter portion, or at a sub-harmonic thereof. Rater, as disclosed at the cited location of the reference, this signal is at a frequency that is the *difference* between the center frequency of the RF transmitter and the center frequency of the receiver. This difference is neither the transmit band center frequency itself, nor is it a sub-harmonic thereof. Accordingly, this cited location of the Bednekoff et al. reference does not teach what the Examiner asserts.

For these reasons, Applicant respectfully submits that the Bednekoff et al. reference simply does not teach what the Examiner found it to teach, either expressly or inherently. Applicant therefore respectfully submits that the combined teachings of the Morishige et al. and Bednekoff et al. references fall short of the requirements of amended claim 1.

Claims 3 through 7 and 13, which directly or indirectly depend on claim 1 (claim 13 amended above to depend on claim 1 rather than claim 2, which is now canceled), were rejected as unpatentable over the Morishige et al. and Bednekoff et al. references, as applied against

[18] Bednekoff et al., *supra*, column 2, lines 44 through 47.
[19] Bednekoff et al., *supra*, column 2, lines 37 through 43; Figure 3.

claims 1 and 2, in view of the Tolson et al. reference[20]. The Tolson et al. reference was applied against these claims as teaching various implementations of high pass filters.

The undersigned appreciates the copy of the priority application to the Tolson et al. reference, which the Examiner provided with this Office Action.

Applicant respectfully submits that the combined teachings of these references fall short of the requirement of amended claim 1 and all of its dependent claims. As mentioned above, the Morishige et al. and Bednekoff et al. references both fail to disclose a mixer in a receiver that receives a local oscillator signal having a frequency equal to the center frequency of a transmitter section or a sub-harmonic thereof, as claimed. The Tolson et al. reference fails to add any teachings, expressly or inherently, regarding this local oscillator frequency. Accordingly, Applicant respectfully submits that the combined teachings of the Morishige et al., Bednekoff et al., and Tolson et al references necessarily fall short of the requirements of amended claim 1. The other references of record also lack teachings in this regard.

Applicant further submits that there is no suggestion from the prior art to modify these teachings in such a manner as to reach the requirements of amended claim 1, much less any of its dependent claims. This lack of suggestion is even more evident considering the important advantages provided by the invention of claim 1 that include, among others, the elimination of interference from the strongest interference source without requiring expensive surface acoustic wave (SAW) type, which cannot be readily integrated into the radio integrated circuit.[21] These advantages stem directly from the difference between the claimed apparatus and the prior art, and as such further support the patentability of amended claim 1 and its dependent claims over the prior art.

For these reasons, Applicant submits that the invention of claim 1 and its dependent claims 3 through 7, and 13are patentably distinct over the applied references.

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[20] U.S. Patent No. 6,625,436 B1, issued September 23, 2003 to Tolson et al., and having a filing date of July 28, 2000.

[21] *See* specification of S.N. 09/785,759, page 5, lines 9 through 16.

Claim 8 was also rejected under §103 as unpatentable over the combination of the Morishige et al. and Bednekoff et al. references, as applied against claim 1. Dependent claims 9 through 12 were also rejected under §103 as unpatentable over the Morishige et al. and Bednekoff et al. references, in view of the Tolson et al. reference, on similar grounds as the claims dependent on claim 1.

Claim 8 is also amended to clarify its patentability over the applied references. Amended claim 8 now expressly recites that the transmit signal produced by the transmit section of an FDD radio is in a transmit frequency band having a center frequency, and that the method is directed to minimizing interference caused by that transmit signal on a signal received by the receiver section of the radio, at a receive frequency that differs from the transmit band center frequency. The method further requires the providing of a local oscillator (LO) signal to a first down conversion section of the receiver, at a frequency equal to the transmit band center frequency or a sub-harmonic thereof. Support for the amendment to claim 8 is clearly provided by the specification, at the locations cited above for the amendment to claim 1. As discussed above relative to claim 1, this amendment to claim 8 is intended to more clearly recite that the LO signal has a frequency that corresponds to the transmit band center frequency of duplexed signals transmitted by the same FDD radio, and that this frequency differs from the received signal. In the method of claim 8, therefore, the LO signal is therefore related to the center frequency of the FDD transmit signal, rather than to the receive signal frequency.

For similar reasons as discussed above, Applicant respectfully submits that amended claim 8 is patentably distinct over the Morishige et al. and Bednekoff et al. references, on the grounds that the combined teachings of these references fail to meet the requirements of the claim.

Both the Examiner and Applicant agree that the Morishige et al. reference does not disclose a receive mixer that receives a local oscillator signal at a transmit band center frequency. However, Applicant submits that the Bednekoff et al. reference also does not disclose, either expressly or inherently, this local oscillator signal. The local oscillator **365** of the Bednekoff et al. reference does not generate a signal that is at the transmit band center frequency, or at a

frequency that is in any way related to the transmit band, much less at a sub-harmonic of the transmit band center frequency. As previously discussed, the local oscillator **365** of the Bednekoff et al. reference generates a signal at a frequency (*e.g.*, 1611 to 1671 MHz) that differs from the transmit local oscillator frequency of 1930 to 1990 MHz.[22] These two frequencies clearly differ from one another, such that the reference does not teach a local oscillator signal in the receive section that is at a frequency equal to the transmit band center frequency.

Nor does the reference inherently provide that its local oscillator signal is at a sub-harmonic of the transmit band center frequency. Applicant submits that the common definition of "subharmonic" refers to a wave having a frequency that is a fraction of a fundamental frequency, as shown in the art.[23] In short, Applicant submits that for a signal's frequency to be a sub-harmonic of another frequency, the signal frequency must have some fractional relationship to the other frequency. But no such relationship is disclosed or suggested by the Bednekoff et al. reference. The transmit frequency band of the Bednekoff et al. reference is 1930 to 1990 MHz,[24] putting a center frequency at 1960 MHz. However, the local oscillator **365** frequency is disclosed to be in a range from 1611 to 1671 MHz.[25] No simple or meaningful fractional relationship between these frequencies exists, nor is there any other disclosed relationship between these frequencies. Rather, the local oscillator frequency is selected, according to the Bednekoff et al. reference, relative to the receive frequency, so that the mixer provides a desired intermediate frequency of 239 MHz.[26] The Bednekoff et al. reference therefore fails to expressly disclose or inherently provide a local oscillator frequency, on the receive side of an FDD radio, that is in any way related to a transmit band center frequency, much less be at a subharmonic (fraction) of that transmit band center frequency.

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[22] *See also* Bednekoff et al., *supra,* column 6, lines 52 through 57.
[23] '242 patent, *supra,* at column 1, lines 55 and 56, and column 4, lines 22 and 23; '372 Patent, *supra,* Abstract, column 3, lines 62 through 65; '830 Patent, *supra,* column 2, line 66 through column 3, line 4.
[24] Bednekoff et al, *supra,* column 5, lines 62 and 63; column 6, lines 52 through 54.
[25] Bednekoff et al., *supra,* column 6, lines 18 through 22.
[26] Bednekoff et al., *supra,* column 5, lines 52 through 54; column 6, lines 22 through 25.

Applicant therefore respectfully submits that the combined teachings of the Morishige et al. and Bednekoff et al. references fall short of the requirements of amended claim 8 and its dependent claims.

The Tolson et al. reference also fails to provide any teachings regarding a local oscillator signal having a frequency equal to the center frequency of a transmitter section or a sub-harmonic thereof as applied to a down conversion section of a receiver, and thus does not make up for the shortfall of the Morishige et al. and Bednekoff et al. references in this regard. Applicant respectfully submits that the combined teachings of the Morishige et al., Bednekoff et al., and Tolson et al references, and the other prior art of record in this case, fall short of the requirements of amended claim 8 and its dependent claims.

Nor is there suggestion to modify these combined teachings in such a manner as to reach the requirements of claims 8 through 12. The important advantages provided by the claimed method, such advantages including the eliminating of interference from the transmit signal without requiring expensive SAW filters and the like, further support its patentability over the prior art.

For these reasons, Applicant submits that amended claim 8 and its dependent claims 9 through 12 are patentably distinct over the applied references.

Claim 14, as originally filed, recited that its method was directed to an FDD radio, and that the desired receive signal by the radio is at a receive center frequency differing from the transmit center frequency. As such, no clarifying amendment (similar to that provided for claims 1 and 8 and discussed above) is necessary relative to claim 14.

However, this independent claim 14 was also rejected under §103 as unpatentable over the combination of the Morishige et al. and Bednekoff et al. references, in view of the Tolson et al. reference, applied as discussed above. Applicant again respectfully traverses the rejection of claim 14.

As previously argued, and as argued above relative to claims 1 and 8, Applicant submits that the Bednekoff et al. reference does not teach the mixing of the receive signal with a local oscillator frequency equal to the transmit center frequency or a sub-harmonic thereof, as required by claim 14. Specifically, the local oscillator **365** of the Bednekoff et al. reference does not generate a signal that is at the transmit band center frequency, or at a frequency that is in any way related to the transmit band, much less at a sub-harmonic of the transmit band center frequency. Instead, the frequency (*e.g.*, 1611 to 1671 MHz) of the signal output by this local oscillator **365** differs from the transmit local oscillator frequency of 1930 to 1990 MHz.[27] Nor does the reference inherently provide that its local oscillator signal is at a sub-harmonic of the transmit band center frequency. Applicant submits that the common definition of "subharmonic" refers to a wave having a frequency that is a fraction of a fundamental frequency,[28] such that there must be at least some fractional relationship of the alleged subharmonic to the fundamental frequency. No such relationship is disclosed or suggested by the Bednekoff et al. reference, as previously discussed; indeed, the frequency of this local oscillator is selected to produce a desired intermediate frequency of (239 MHz[29]) relative to the receive frequency. The Bednekoff et al. reference therefore fails to expressly disclose or inherently provide a local oscillator frequency, on the receive side of an FDD radio, that is in any way related to a transmit band center frequency, much less be at a subharmonic (fraction) of that transmit band center frequency.

And considering that neither the Morishige et al. and Tolson et al. references teach this local oscillator frequency, Applicant submits that the combined teachings of the applied references fall short of the requirements of claim 14. And for the reasons discussed above relative to claims 1 and 8, Applicant submits that there is no suggestion from the prior art to modify these teachings in such a manner as to reach claim 14.

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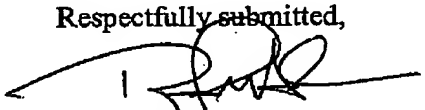
[27] *See also* Bednekoff et al., *supra,* column 6, lines 52 through 57.
[28] '242 patent, *supra,* at column 1, lines 55 and 56, and column 4, lines 22 and 23; '372 Patent, *supra,* Abstract, column 3, lines 62 through 65; '830 Patent, *supra,* column 2, line 66 through column 3, line 4.
[29] Bednekoff et al., *supra,* column 5, lines 52 through 54; column 6, lines 22 through 25.

The §103 rejection of claim 14 is therefore respectfully traversed. Reconsideration is requested.

Applicant therefore respectfully submits, for the reasons stated above, that claims 1, and 3 through 14, are all patentably distinct over the Morishige et al., Bednekoff et al., and Tolson et al. references, and the other prior art of record in this case.

For these reasons, Applicant respectfully submits that all of the claims in this case are in condition for allowance. Reconsideration of this application is therefore respectfully requested.

Respectfully submitted,



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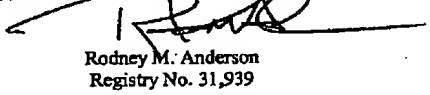

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